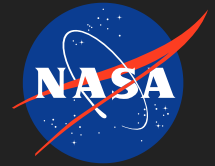


Cloud and tree canopy thickness detection from low resolution Lidars

Completed Technology Project (2014 - 2015)



Project Introduction

The IM-CW system is currently designed for CO₂ integrated path differential absorption (IPDA) measurements. Backscattered science signals of the online and offline wavelengths from the surface as well as aerosols and clouds are simultaneously collected with a telescope, optically filtered with a narrow band optical filter, and detected by a single detector. Both the science and reference signals are amplified, electronically filtered and then digitized for retrievals of column CO₂ using IPDA approach. Post processing of the digitized science and reference data allows for discrimination between ground and intermediate scatterers using the matched filter technique. Our technique takes a repeating signal such as a repeating CW sweep or pulse train, interpolates it using our unique frequency domain reordering technique. This interpolation technique takes a repeating waveform and converts it into a single waveform interpolated by the number of repeats in the sample. This is then enhanced further with our unique variation on the Richardson Lucy deconvolution technique and using a point spread function derived through measurement. By iterating the RL deconvolution by a specific amount, we have been able to enhance the resolution as much as 2 orders of magnitude, making it possible to use a low-resolution lidar to measure tree canopy height or discriminate between thin clouds. This has been demonstrated both in ground testing and flight tests. The results were published in Optics Letters in two separate journal articles. These results were also presented at both the American Geophysical Union and the European Geophysical Union.

Anticipated Benefits

technique will help with atmospheric model development



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

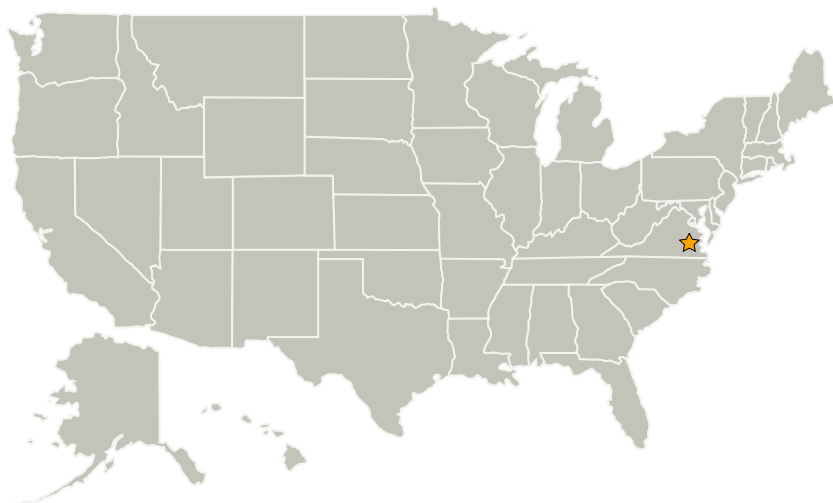
Center Innovation Fund: LaRC CIF

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Julie A Williams-byrd

Project Manager:

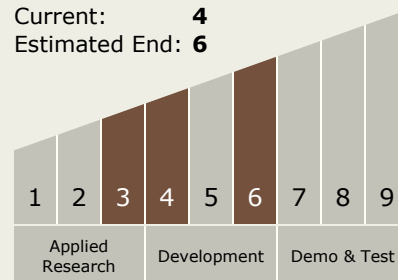
Sandra P Walker

Principal Investigator:

Joel F Campbell

Technology Maturity (TRL)

Start: 3
Current: 4
Estimated End: 6



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.1 Remote Sensing Instruments/Sensors
 - TX08.1.5 Lasers